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Northwestern APPLE PACKING HOUSES

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THE CONSTRUCTION of well-planned and well-equipped packing houses is essential to the economical handling of boxed apples in the Northwest. The recent building program has not kept pace with the demand of the industry, and severe losses have been sustained on account of limited facilities for packing and for storing unpacked fruit temporarily. The situation has been aggravated by the enormous increase in production during the past few years, as well as by the serious shortage of transportation equipment.

This bulletin deals with the details of construction, arrangement, equipment, and operation of boxed apple packing houses and is based on a study of methods and practices which have given the greatest satisfaction in commercial operations.

Contribution from the Bureau of Markets
GEORGE LIVINGSTON, Chief

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NORTHWESTERN APPLE PACKING HOUSES.

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APPLE PACKING HOUSES may be classified in two groups, individual packing houses, which are more commonly known as ranch packing houses, and community houses, operated either by cooperative associations or by individuals. The percentage of the crop packed in community houses is increasing steadily, and though no definite figures are available careful estimates show that the amount increased from about one-fourth of the total crop in 1916 to approximately one-half of the crop in 1919. The same basic principles of construction and equipment are applicable to all types of houses and the equipment and methods of operation in the larger community houses are suitable to a large extent for use in the ranch houses. The fruit should be passed through the various operations in an orderly way, moving in one direction from the receiving point to the storage or car.

COMMUNITY PACKING HOUSES.

Community packing houses (See fig. 1) are especially desirable in the apple-growing districts of the Northwest, where the acreage is usually concentrated in the river valleys and where individual holdings with few exceptions are small, ranging from 5 to 15 acres. A group of growers by joining forces may easily finance the erection of a modern packing establishment. In a community house it is possible to perfect an organization of trained men to bring the grading

and packing operations to a uniformly high standard. The operations are generally on a scale large enough to warrant the employment of competent workmen to supervise the various operations, and the cost of inspection is greatly reduced by having this work done at a central point. The cost of packing in a community house is not always lower than where the work is done by the individual, but it usually can be done more rapidly.

One important factor in favor of central houses is better conditions for the employment of labor. Very few of the smaller ranches have adequate housing and subsistence facilities for the care of their additional help during the packing season. Such living conditions as

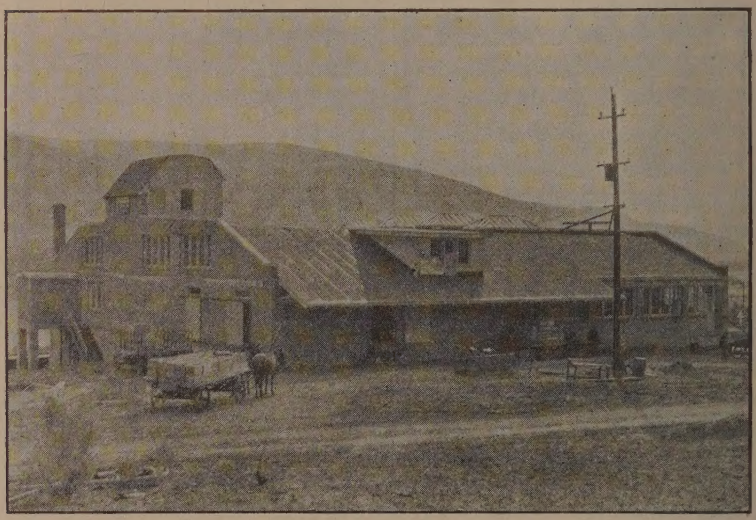


FIG. 1.—A well-constructed community apple packing house.

are shown in figure 2 do not attract laborers. Some growers have tried hauling the packers back and forth from town each day, but this practice is not satisfactory because much time is lost on the road. Then, too, help is usually at such a premium that if one person is tardy in reporting the grower will detain the remainder of the crew awaiting his arrival. As the work is generally paid by the piece the employees are inclined to seek employment where they can put in full time and have comfortable living quarters. (See fig. 3.) In community houses it is also easy to provide for the comfort of the employees in the packing room. Such rooms when provided with an abundance of sunlight are very comfortable during the greater portion of the day, but during extremely cold weather and in early morning artificial heat is needed. Some of the larger houses have steam or hot water heat for the offices, and pipes could be installed

along the side walls of the packing room. Hot-air furnaces and oil or coal stoves can also be used satisfactorily.

To provide for the comfort of the employees while engaged in packing on hot summer days, it has been found advisable in some houses to place about 8 inches of mill shavings or sawdust in the ceiling to keep out the heat. If the roof is flat or the loft is not used for the storage of boxes, this insulating material may be placed loosely on the ceiling boards. This arrangement also serves to retain the heat in cold weather.

FIG. 2.—Inadequate facilities for housing employees have made the labor problem more difficult.

SEPARATE PACKING AND STORAGE ROOMS.

Although the better class of house is utilized usually for both packing and storage purposes, it should be understood at the outset that the fundamental principles underlying the construction of storage houses and of packing rooms are by no means identical. Packing in storage rooms is a far too common practice. A storage room should be well insulated, properly ventilated, without windows, and with relatively few doors for use in receiving and delivering the fruit. It should be used solely as a storage house. On the other hand, the best type of packing room is provided with abundant light and adequate operating space and should be equipped to furnish artificial heat during the cold weather for the comfort of the employees. Such a room is not fitted for the storage of either loose or packed fruit, as the quality of apples is invariably impaired

by the high temperatures. In a large number of houses, proper provision has been made for the storage of packed fruit, but in comparatively few houses is the loose fruit storage separate from the packing operations. (See fig. 4.)

LOCATION.

The best site for a ranch packing house usually is found near the residence and other farm buildings, close to the main traveled road. Such a location is particularly desirable where there is a common storage house in connection with the packing house, as the storage house is usually air cooled and requires the attention of some one to operate the ventilators during the storage season. If the house is a considerable distance from the ranch house it is less likely to be cared for properly. In large orchards situated on level land

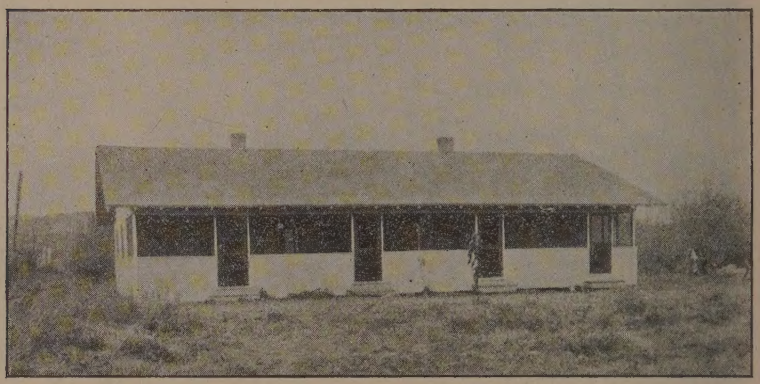


FIG. 3.—Inexpensive but comfortable living quarters of this type are being built by many growers.

it is often an advantage to locate the packing house near the middle of the orchard to reduce the hauling distance for the loose fruit. In such cases it is necessary to provide a good road from the house to the main traveled road to facilitate the hauling of packed fruit. If the orchard is located on hilly land the house should be built at a point which will necessitate the minimum amount of uphill hauling. Sometimes a hillside can be utilized to advantage by placing the packing room on the second floor and providing for receiving the fruit on this floor on the upper side of the building. (See fig. 1.) The packed fruit can then be conveyed by means of gravity conveyors to the storage room on the ground floor and loaded out on the lower side of the house. The receiving platform should be level with the wagon beds, and the loading platform should also be at this level or at the level of the car floor in case the house is on the railroad.

A community house, wherever possible, should be located on the railroad to eliminate the expense of hauling packed fruit to the car and to permit the loading of cars when weather conditions prevent hauling.

SOME POINTS IN CONSTRUCTION.

Wood, brick, concrete, or tile are used in the construction of packing houses, the choice of materials being determined by the cost and

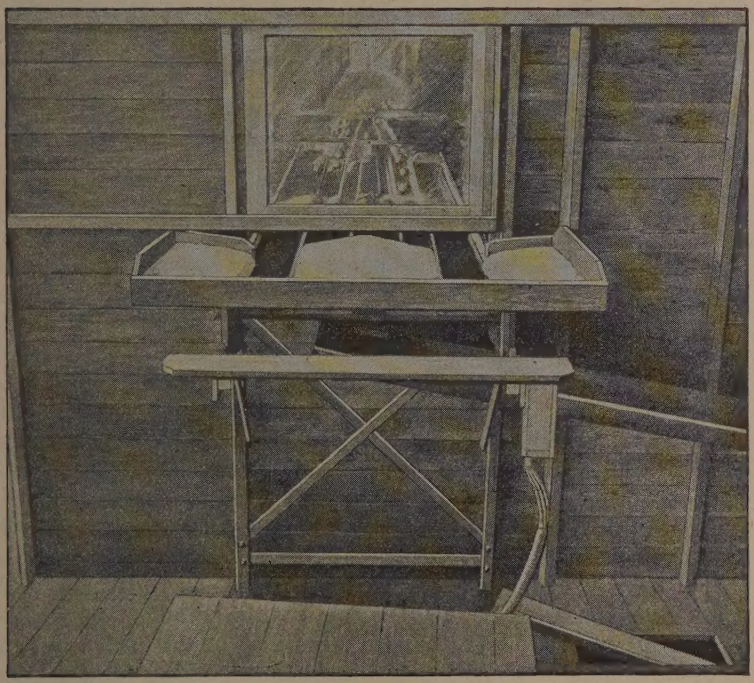


FIG. 4.—In this house the packing room is separated from the loose fruit storage by an insulated partition. The feeding hopper of the sizing machine is in the loose fruit storage, but the dumper has a view of the grading operations through the window. This is a very desirable arrangement.

the fire risk. As the packing and storage rooms are usually parts of the same building, the same material is ordinarily used in the construction of each unit, although the storage room is insulated, and the packing room is not. Where the cost of excavating is high or where water is encountered in excavating, it is more economical and satisfactory to build a house without a basement. In the past, one-story houses have been popular because the fruit could be handled more economically on one floor. It is, however, more expensive to construct a one-story house with a given floor space than to construct

a two-story house with the same floor area, and in recent years the development of efficient mechanical conveyors has made it possible to elevate the fruit to an upper floor at a very low cost. In a two-story packing house built without a basement, one end of the upper floor should be used for packing operations, as it may be lighted from three sides. The remaining space may be blocked off by the use of an insulated divided partition such as is shown in figure 4 and used for the storage of loose fruit. The ground floor is used for assembling and storing the packed fruit. To provide a clear floor space in the packing room, the roof should be carried upon trusses. It is frequently desirable to provide covered platforms for receiving the loose fruit and loading out the packed fruit. Where these are used, the house should be so arranged that the packing room will not be cut off from the light.

It is impossible to determine, with any accuracy, the size of a house to build to accommodate a given tonnage. Under the conditions which have prevailed in recent years, the transportation companies have been unable to provide a regular supply of cars, and a house designed to ship several cars a day may not receive any for several days; so it is necessary to provide an amount of storage space which, under other circumstances, might be considered excessive. A house built on a railway spur and designed to provide a large number of loading-out doors together with abundant packing facilities has proved most desirable, especially in some districts where, during the early fall, a large number of refrigerator cars have usually been held on the side tracks and in the railroad yards awaiting loading.

For the first few weeks of the shipping season, the railroads are able to meet all demands for cars, and of course they want to have this equipment loaded and in service. Houses constructed with these conditions in mind have been able to take advantage of the abundant supply early in the season. Other houses which control an equal amount of tonnage, but with limited packing facilities and relatively few loading-out doors, have been forced to ship later in the season when cars were scarce and often during severe winter weather when large losses were suffered from freezing in transit. Such concerns have been forced to provide larger storage accommodations both for loose and packed fruit than those which have been fortunate enough to start their shipments promptly.

LIGHTING.

The most important feature in the construction of the packing house, but the most commonly neglected, is the arrangement for proper lighting. The most efficient work is possible only when the room is properly illuminated at all times. Most people understand

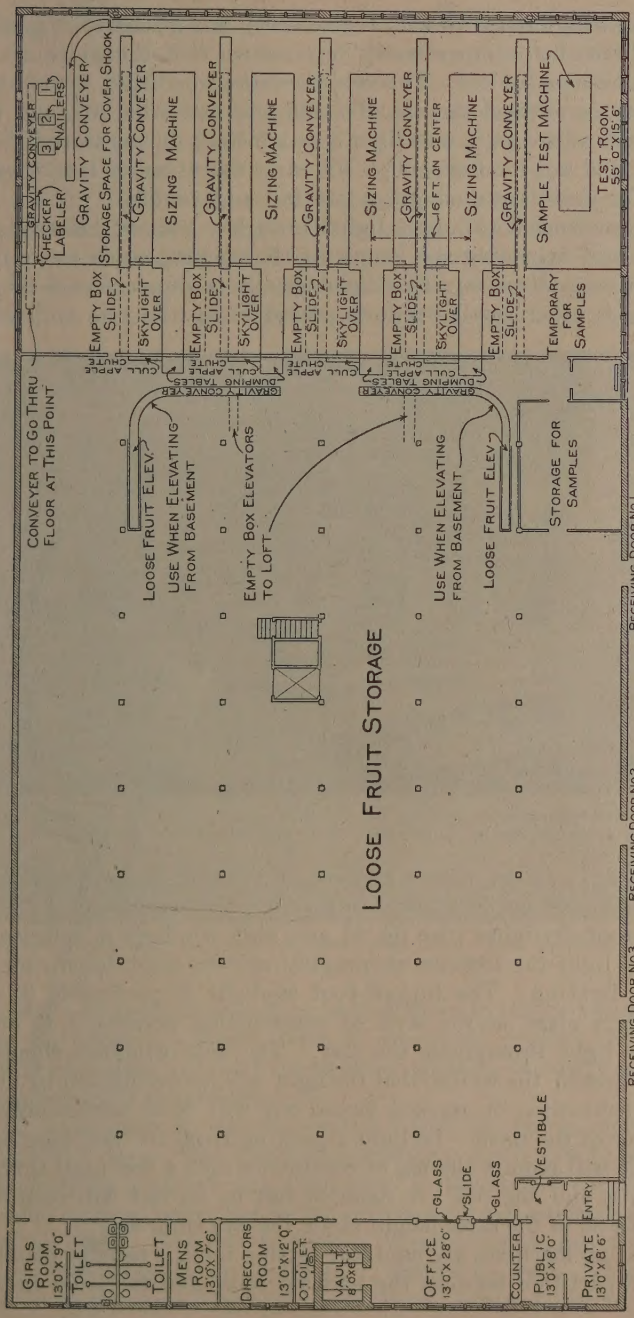


FIG. 5.—Floor plan for a well-arranged community packing house.

that dim lighting interferes with the accuracy and efficiency of grading operations, but comparatively few realize that the glare of a direct light is equally bad. To avoid the latter condition, architects have sometimes advised the use of north and east windows, and if enough windows are used, such light is satisfactory during the middle of the day, but not intense enough for early mornings or late afternoons or for dull days during the late fall and winter.

Houses constructed to admit light through a narrow lantern or penthouse roof extending the length of the packing room are very common in some districts. This light usually is supplemented by a few low and rather small windows placed along the side and end

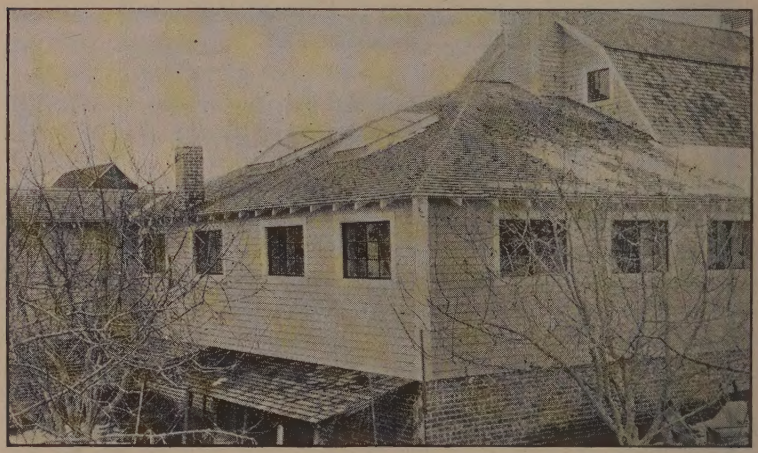


FIG. 6.—A well-lighted ranch packing house. This packing room is separated from the apple storage by a partition. Note the hipped roof skylights.

walls (See fig. 1); but such a method of lighting is very unsatisfactory and should not be allowed in future construction.

Hipped-roof skylights (See fig. 6) and high windows in sufficient numbers to light the interior thoroughly are the most satisfactory method of lighting. The hipped-roof skylight is preferable to a straight plain glass, as the style of construction permits it to receive some light throughout the day. The side windows should be placed 5 feet up the wall so that the light will not be blocked by the machines, conveyors, or stacked boxes, but will flood unobstructed to the center of the room. To light a packing room 100 feet long by 70 feet wide will require the use of continuous sash 4 feet high along the two sides and one end. A room 40 feet by 60 feet will require continuous sash of the same height along the two sides only.

Where sizing machines are used, the sorting table is usually placed next to the partition between the packing room and the loose fruit

storage, so that the sorters receive very little light from the windows at the opposite end of the room. To increase the amount of illumination at this point hipped-roof skylights should be installed over each sorting table. These skylights should be made of translucent glass to diminish the glare of the sun on bright days. They need not be larger than 3 feet by 4 feet in size. Where the house is constructed with a loft, light shafts or wells are used to admit the light and concentrate it directly over the sorting table. These shafts should flare so that at the bottom, which is directly over the heads of the sorters, the dimensions are the same as those of the sorting table. When hand tables are arranged down the center of a large packing room, a large

FIG. 7.—The packing room of a large community house. Note the sizing machines and skylights over the sorting tables.

hipped roof skylight should be placed above to insure plenty of light for the graders. White paint is commonly applied to the light shafts and other parts of the packing room to intensify and reflect whatever light is available.

It is necessary to provide electric lights for use at night and on very dark days. The packing operations which can be conducted efficiently in a rather dim light can be illuminated by globes suspended by drop cords, but such a provision is not satisfactory for the sorting table. For this purpose a rectangular-shaped reflector or hood, such as is shown in figure 7, should be used. The reflector should be the same length as the table and about 18 inches wide. It

should be suspended by ropes and equipped with a pulley so that it may be drawn up and away from the table when natural light is available. Such a reflector protects the eyes from all glare and also enables the sorting crew to concentrate their attention better on their work as a view of the workers on the opposite side of the table is obstructed. This reflector should be furnished with six 75-watt blue glass daylight nitrogen electric globes. The light from such globes is not glaring and is the best substitute for sunlight in examining defects and color.

HAULING.

In former years the apples, both loose and packed, were hauled in wagons (Fig. 8), but motor trucks have replaced them to a very large

FIG. 8.—Special wagon bodies equipped with racks are used for hauling boxed apples.

extent. It is probable that the cost of this operation has not been lowered materially by the change, but the time and labor have been reduced, and both of these factors are exceedingly important during the packing season. As a general thing, individual growers can not afford to maintain trucks to be used only for a comparatively short season, and for that reason, they, and often the dealers and growers' associations as well, find it more convenient and economical to contract for this work. Often trucks are brought to the fruit districts from neighboring cities to haul during the harvesting season.

Trucks are especially desirable on account of their speed, smooth carriage, and large capacity. It is not uncommon for large trucks

to haul as many as 300 boxes at a load. (See fig. 9.) Loose fruit is frequently hauled for long distances to central packing houses, but the roads in most districts are in excellent condition, so that when the trucks are not overloaded little bruising occurs. Both wagons and trucks should be equipped with special bodies and racks to secure proper distribution of the load as well as to facilitate the loading and unloading of the boxes.

ORGANIZATION AND PERSONNEL.

Every large packing house should have a general manager to act as the business head of the institution. This man must possess ini-

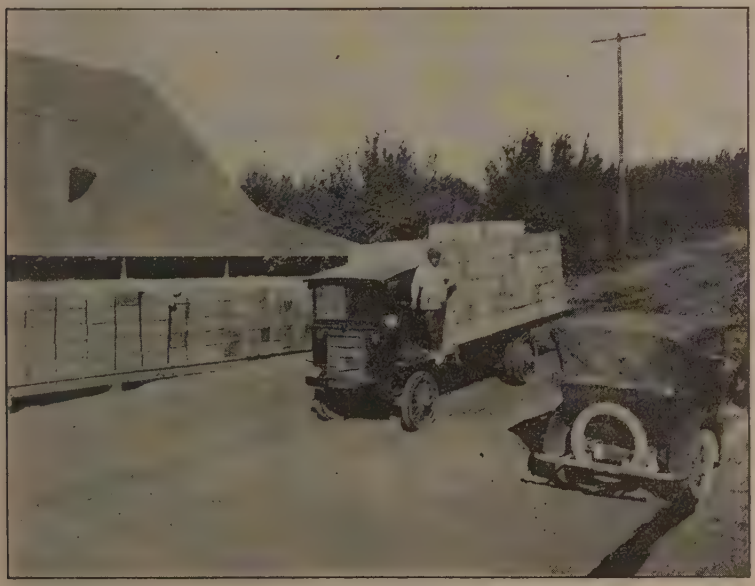


FIG. 9.—A truck loaded with 315 packed boxes of apples.

tiative and good judgment, for the success of the organization will depend upon his ability. While it is not necessary that he be a specialist in the details of operation, he should possess sufficient general knowledge to judge the efficiency of all phases of the work.

There must also be a thoroughly competent man in the position of packing foreman to bear the direct responsibility for the successful conduct of the packing operations. This foreman should possess orderly habits, cool judgment, tact, and ability to handle labor. He should be an expert grader and packer and should also have enough mechanical skill to regulate the packing-house machinery. Where the operations are not too large he may also do the inspecting necessary to keep the pack up to the required standard. All the employees

except the receiving clerk and checker who record the incoming and packed fruit should be responsible solely to him. These two employees should be a part of the office force, and the errors which often occur in this work should be reported promptly to the office.

One important duty of the foreman is the training of the inexperienced help. In carrying on work of this kind which lasts only a few months in the year, it is necessary to employ transient labor. Some houses have a school for packers each fall before the main season begins. In this way, the foreman is enabled to select packers who can do their work speedily and well. If the sizing is done by machines, this is a comparatively simple task, but packing unsized fruit requires considerable experience and is an art which some persons never acquire. Men to do the lidding can be trained for this work by having them make up boxes early in the season.

Most of the packing and sorting is done by women. Women adapt themselves readily to packing operations and have proved very efficient.

The number of employees needed to pack a given amount of fruit per day depends upon various factors, such as the quality of the fruit, the type of equipment used, the facilities for handling, the efficiency of the management, and the experience of the packers and sorters. Under normal conditions, a crew for a large sizing machine should consist of a foreman, a receiving clerk, one trucker to deliver the fruit to the dumper and to remove culls and boxes, one dumper to pour the fruit into the feeding hopper, one man to wait on the women packers and to do the stamping, one lidder, one checker, and one man to assemble the packed fruit on the basis of grade and size. This man may also help with the labeling and may do some trucking. As has been indicated, the number of necessary sorters and packers will depend upon a variety of conditions. When the fruit is of poor quality and contains a large percentage of culls, such a machine may require 10 sorters, but with a good grade of fruit the same operation can be performed efficiently with but 6 sorters. The average packer will pack about 125 boxes per day from a machine, and a skilled packer will average 150 boxes.

Where two machines are used, the cost of operation is somewhat lower, as the foreman, receiving clerk, and some other employees can handle the work of both. The largest sizing machines will not average over 750 boxes a day if all the districts are taken into consideration. Some houses will average 1,000 boxes a day throughout the season, but others equipped with the same type of machine will fall as low as 600 boxes a day.

Where grading belts or hand tables are used, the packing force will be larger. The average packer working on unsized fruit rarely aver-

ages more than 75 boxes a day, although some professionals pack from 100 to 125 boxes.

Careful inspection is absolutely necessary to the maintenance of the uniform grade. The common practice of associations which handle the crops of a number of growers is to pool the fruit of the same variety and grade in order that returns may be made on a basis of the average price received. In making up these pools, it is essential that an inspector be employed to keep a check on the lots going into the various grades. Such private inspection is usually supplemented by State inspection, which is carried on for the purpose of securing conformity to the State grading laws. The State inspector should never be employed by the organizations they serve, as it is not a good principle to permit the employees of an organization to pass upon their own acts.

CARE IN HANDLING FRUIT.

Every operation involved in the handling of apples from the tree to the car should be surrounded with adequate precautions against injury to the fruit which might result in deterioration and loss. It has been pointed out already that the packing room should be entirely separate from the temporary storage. The quality of northwestern apples has suffered enormously from improper provision for holding the loose fruit; for in order to guard against loss from freezing it usually is necessary to pick the whole crop several days or even several weeks before it can be packed, and very few growers have sufficient loose fruit storage on the ranch. When the fruit is sold for cash, the buyer frequently provides such facilities, and in the case of growers' associations this accommodation is supplied by the central packing houses.

Losses from careless handling are sustained every year, but in seasons such as that of 1919–20, when a shortage of cars necessitated the storage of a large part of the crop at shipping point, the shrinkage was most apparent. The previous season the boxed-apple market closed at extremely high prices, and many growers and shippers looked for a repetition of that situation. The fall and early winter packing was carried on with a rapidly advancing market. The shortage of labor, of packing and storage facilities, and of cars, all were acute, and perhaps there has never been such a rush to get the crop packed and stored before freezing weather. All of these factors resulted in such hurried and careless handling of the fruit that in many instances shippers found it necessary to repack their stock before shipment.

A large part of the decay in northwestern apples is caused by blue mold, an organism which seldom if ever affects sound fruit. Some of the common ways in which apples are injured in commercial opera-

tions are as follows: Bruising by the pickers or by emptying the fruit carelessly from the picking receptacle into the orchard box, by stacking the filled slatted-bottom orchard boxes on the stubble of alfalfa which is commonly grown between the trees as a cover crop, by carelessly stacking or loading orchard boxes, and by hauling the loose fruit over rough roads in improperly equipped trucks or wagons.

After being delivered at the packing house the fruit is frequently handled roughly in unloading and stacking in the temporary storage. Later, unnecessary bruising is caused by careless dumping on the sorting tables or feeding hoppers. When apples are delivered from the sizing-machine cups with considerable force and roll the full length of the sloping bins stem punctures are very likely to occur.

One of the most serious causes of injury is allowing the bins to become so full that the apples, falling from the sizing cups, fall directly upon the fruit in the bins below or perhaps overflow into adjacent bins. Under such conditions the carrying cups of one type of machine will drag over the bins and injure the apples. Injury is also caused by the packers roughly pulling the fruit toward them when the supply is low. In grading-belt operations serious bruising is often caused by the sorters throwing the apples to the packers' tables or bins. Probably the chief cause of stem punctures and injuries, which can be directly attributed to packing-house operations, is the practice of some packers of throwing each apple into the box with force sufficient to bruise the fruit. Unless sufficient care is exercised to see that each apple stays in place it may be turned in such a position that when the next layer is placed in the box the fruit may strike on the stems of the lower layer. Such varieties as Jonathan and Rome Beauty, on account of their tender skins and long stems, are especially susceptible to this sort of injury.

If the machines are properly adjusted and the fruit is not permitted to pile up in the bins directly under the discharging point, very few apples will be bruised by sizing machines. Although it might seem that machine sizing would result in more injury than careful hand work, this is apparently not the case, as repacking has been quite as common in houses which conducted the operations by hand. In the lidding operation nails should be driven straight so that they will not protrude from either side of the box. The lidders often drive the first two nails on a slant toward the inside of the box so that they will not protrude and injure those doing the handling; but nails driven in this way cause severe injury to the apples.

GRADING BELTS.

Grading belts, which are in very common use in some districts, are inexpensive, economical to operate, and take up less floor space than most sizing machines of similar capacity. (See fig. 10.) They con-

sist of an endless canvas belt about 22 inches wide run over drums approximately 15 inches in diameter at each end. The belt is supported by a smooth board surface, and 2-inch wide strips are used to prevent the fruit from rolling off. The grading belt and board surface over which it runs are supported by a wooden frame. The height of the belt is about 42 inches and the usual width is 26 inches, including the frame. The lower section of the belt is used to convey the fruit to a receptacle at the head of the grading table. The fruit is fed to the belt by a short sloping table, and the graded fruit is diverted into the bin by means of deflectors.

There are numerous variations in the equipment, but all such belts operate on the same principle. The belt carries the ungraded fruit before the sorters, by whom it is sorted and distributed to

FIG. 10.—Grading belts are in common use in the Northwestern apple districts.

various bins. These bins are usually arranged along the sides and at one end, although in one type the bins are arranged along one side and at the end. This latter type of construction necessitates the tossing of fruit across the belt into the bins on the opposite side, which has proved to be an unsatisfactory arrangement, as the fruit is bruised in this operation.

Ordinarily the fruit is not sized by the sorters, and each bin contains the various sizes of the same grade. If efficient and well-trained packers are available this arrangement is satisfactory, but when it is necessary to employ inexperienced labor it is a very difficult matter to secure proper sizing.

When the sorters size the fruit in addition to grading it the first sorter removes the largest size, the next sorter the next smaller size,

and so on, the selection of sizes by the sorters continuing the length of the belt. This is not an economical arrangement, for the fruit as it comes from the orchard is seldom distributed equally between the various sizes, and therefore only a part of the crew is working to full capacity.

HAND TABLES.

The practice of grading, sizing, and packing by hand is still popular in some districts, and where small lots of fruit must be kept separate until packed this system has proved desirable. (See fig. 11.) Small

FIG. 11.—Interior of packing room equipped with packing tables for hand operations.

ranchers and the buyers who purchase fruit on a packed basis favor the hand tables, and no doubt their use has been the most economical for them. But the method has a serious disadvantage in that experienced and conscientious packers must be employed to put out a uniformly sized product. Because of the serious labor shortage many houses have been forced to use inexperienced and unreliable help, so that the packs have not been kept up to the desired standard. A lack of uniformity is particularly noticeable where small lots are run over the table, as it is necessary to clean the table frequently, and at such times even the best packers usually pack odd sizes in the same box.

The equipment used for hand operations consists of a packers' table, a sorter's table, and a packing stand. The packers' table is of frame construction, covered with canvas and divided by padded strips across the top into two, three, or four sections. The canvas sags between the strips, thus forming shallow bins. A two-division table 5 feet long, 26 inches wide, and 30 inches high is probably the most satisfactory size, and such a table is particularly desirable when the packer does his own sizing. A three-division table equipped with bins large enough to give the packers plenty of fruit from which to choose takes up too much space and makes a longer throw for the sorters. Throwing the fruit always results in more or less injury and should be strongly discouraged. It has been observed that the packing bins are generally too wide. Twenty-six inches is the maximum width which will permit the packer to reach conveniently the apples at the far side of the bin.

Usually there is a small sorters' table 20 inches wide by 30 inches long at the side of the packers' table. The fruit is poured on this table one box at a time, and the culls are then removed and the fruit separated into the three standard grades. Care always should be used in dumping the fruit from the orchard boxes to the sorting tables. In order to reduce the injury from careless dumping, a canvas apron or curtain is sometimes tacked to the edge of the table and placed over the top of the box to prevent the fruit from pouring out of the box with a rush. After the fruit is sorted, the apron which covers the bottom of the table is thrown off, and in this way the refuse is removed before another box is emptied. In some instances the fruit is sorted directly from the orchard boxes to the packing bins. This causes less dumping, but it has been found that better work can be done by sorting the fruit from the table, as the larger space allows the defects to be seen more readily.

Where a two-division or a two-bin packers' table is used the Fancy and Extra Fancy grades are placed in the bins and the C grade is removed into boxes. In some houses large tables have been provided where the C grade is packed by the poorer or less experienced packers.

The number of sorters for each packer depends upon the speed at which they work and the grade of the field-run fruit. Under favorable conditions one sorter can keep up with one packer; but if the fruit contains a large percentage of culls, it may require two sorters for each packer. The average for the season will usually show that three sorters are employed for every two packers.

Packers' stands of the type shown in figure 12 are used in connection with hand tables, so that when the supply of any particular size of fruit which is being packed runs low the partially filled box may be moved and the empty box placed into position next to the

table. Packers usually pack two or three boxes at a time, and for that reason most stands are made to hold three boxes. The legs of the packers' stands should be equipped with casters to permit them to be pushed back and forth easily along the bins. Another type of stand sometimes used is attached to the bin so that it may slide back and forth.

SIZING MACHINES.

Sizing machines are in very general use in the Northwest. Out of 95 packing houses which were observed in operation during the 1919–20 season, 47 were equipped with such machines; and while it is true that some packing houses have discarded such equipment in favor of grading belts or hand tables, there are few exceptions to the rule that more uniform sizing is secured where the machines are used. Their chief advantage lies in the fact that good work can be done with inexperienced labor. It has been pointed out already that it requires long experience and more or less natural ability for the packer to size the fruit as he packs, while it is comparatively easy to learn to pack machine-sized fruit.

FIG. 12.—This packing stand holds two boxes. It is mounted on casters so that when the boxes are packed it can be easily wheeled out of the way and replaced by an empty stand.

Much objection has been made to sizing machines because of their low capacity. One reason for this has been that machines are seldom operated at full capacity, for under average conditions the sizing webs or cups are only 50 per cent efficient. In districts where the orchard-run fruit is comparatively free from culls, machines have a much greater capacity than in other districts where a large percentage of the apples must be sorted out. The output could probably be increased by designing a sorting belt or table which would accommodate a larger number of sorters, thus permitting the machine to be operated at approximately its maximum capacity even with poor-quality fruit.

Some packing houses handling the crops of a large number of growers who grow small lots of miscellaneous varieties have objected to machines and grading belts on account of the difficulty of cleaning up the bins at every change. It is suggested that in such circumstances the larger lots may be run over machines and the smaller ones packed over hand tables. Instead of actually cleaning up the bins after each lot, some packing houses estimate the quantity left in the bins and credit this amount to the account of the grower.

A strip of canvas or a padded board partition may be used in the bins to permit the continued operation of the machine with a new lot while the first lot is being finished. Such partitions are particularly desirable when a change in varieties is made.

Perhaps the best method of avoiding the loss of time incident to the handling of small lots of fruit and the keeping of individual lot records throughout the packing operations is the sampling system. This system, which is described later in discussing packing-house operations, relieves the packing house of the work of retaining the

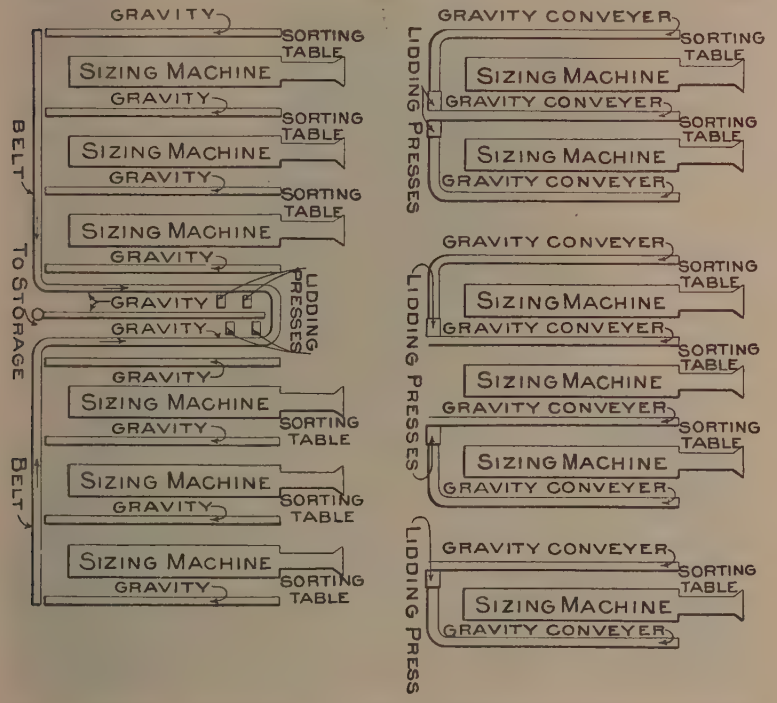


FIG. 13.—Suggested arrangements for gravity conveyors and lidding presses when used with sizing machines.

identity of the fruit of each grower. Each lot of fruit is sampled, and the remainder of the load goes to the loose fruit storage with other fruit of the same variety. The grade of the fruit delivered to the storage is based upon that of the sample. Where this system is used there are no lot records, and the various varieties may be fed to the machine continuously until the supply is exhausted.

At the present time there seems to be a need for sizing machines which will allow a wider distribution of sizes. A comparatively larger number of bins will relieve the situation and give better dis-

tribution. When the fruit is running very uniform in size a few of the bins may be filled to overflowing while others are practically empty, which of course cuts down the capacity of the machine and often causes dissatisfaction among the packers because only a few are kept busy.

Where the fruit is handled as one lot and no separations have to be made for different growers, it may be practicable to run the machines in batteries of 4, with one long sorting belt arranged to carry a separate grade to each machine. Two machines would handle the heaviest grade and the other two machines the two lighter grades. Such an arrangement would give several times the bin capacity that is available when three grades are run over the same machine, and there would be a much better distribution of the different sizes.

There are two types of sizing machines in common use in the Northwest, both of which size the apples on the basis of weight rather than measurement. These machines are manufactured in different sizes which vary in their capacity. The smallest machines handle one or two grades, but the larger ones, used by large growers and by community packing houses, size three grades. The machine consists of three parts, the canvas or roller sorting belt, the sizing section proper, and the packing bins.

One of the most popular types is illustrated in figures 14 and 15. These machines are 6 feet 2 inches wide and vary from 30 to 52 feet in length, depending upon the capacity. The smallest model is equipped with 8 bins and the largest has 48 bins. They are provided either with a canvas sorting belt or with a roller sorting belt regulated by a lever operated by the head sorter, who is able to stop the sorting belt or rolls at any time in order to relieve congestion. Opinion differs as to the relative merits of the two types of sorting belts. Where the canvas belt is used the fruit must be rolled by the sorters in order for them to see the entire surface. The roller sorting table is composed of parallel wooden rolls which are wound in a spiral manner with sash cord. (See fig. 15.) As these rolls are turned the fruit is revolved and carried forward to the sizing device, so that the sorter can see the entire surface of the fruit without touching it with his hands. Some sorters become dizzy when examining apples that are being rolled, but others are not affected in this way. Some also have a fear of pinching their fingers in the rollers. To secure maximum efficiency care should be taken to choose sorters who are not affected in either way.

The sizing unit proper separates the fruit into three grades, each of which is delivered into a separate set of bins. The endless carrier shown in figure 15 is composed of a series of cross rods carried forward by two side chains, and from these cross rods are swung canvas-bottom carrying cups. The cups are held in a horizontal position

by the supporting prongs which slide along the iron side rails. Over each bin there is an opening in these side rails which is bridged by the inner bars of simple balancing scales. At the opposite end of the scale are canvas pockets into which the regulating apples are placed. These apples determine the size of the fruit to be delivered to the bin below so that all that is necessary in order to set the machine for delivery is to place an apple of the desired size in the canvas pocket of the scale, as the fruit delivered to the bin will correspond in size to the regulating apples. For the next regulating apple the next

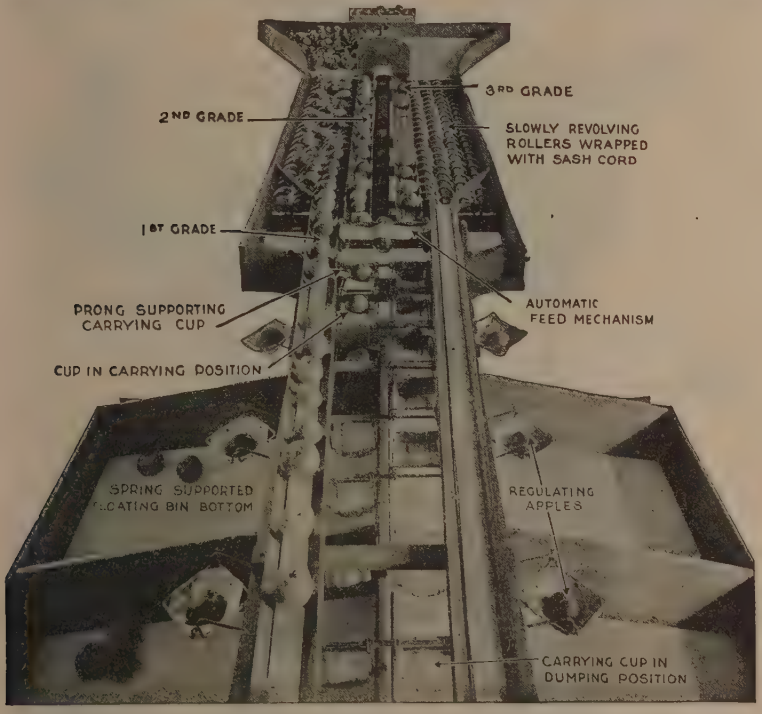


FIG. 14.—Popular type of machine used for sizing boxed apples.

smaller size is placed and so on. Changing the distribution of the fruit to the bins is only a matter of changing the size of the regulating apples. In some packing houses nails are used instead of apples, as the fruit loses weight from evaporation. Rubber bands will serve to hold the nails together and to prevent them from being jarred from the cups.

The cups of the carrier receive the apples, and as they move forward the supporting prongs at the side of these cups pass in turn over the inner bar of each scale until one is reached which is counter-

balanced with a regulating apple that is slightly lighter than the apple in the carrying cup. The inner bar of the scale then is depressed slightly, allowing the supporting prongs to pass through the opening in the side rail and causing the rear end of the carrying cup to lower gradually, thus delivering the fruit to the loops of webbing which are provided to break the fall of the fruit into the bin below.

Another type of machine, shown in figure 16, which also sizes on the weight principle, is of simpler construction and is entirely differ-

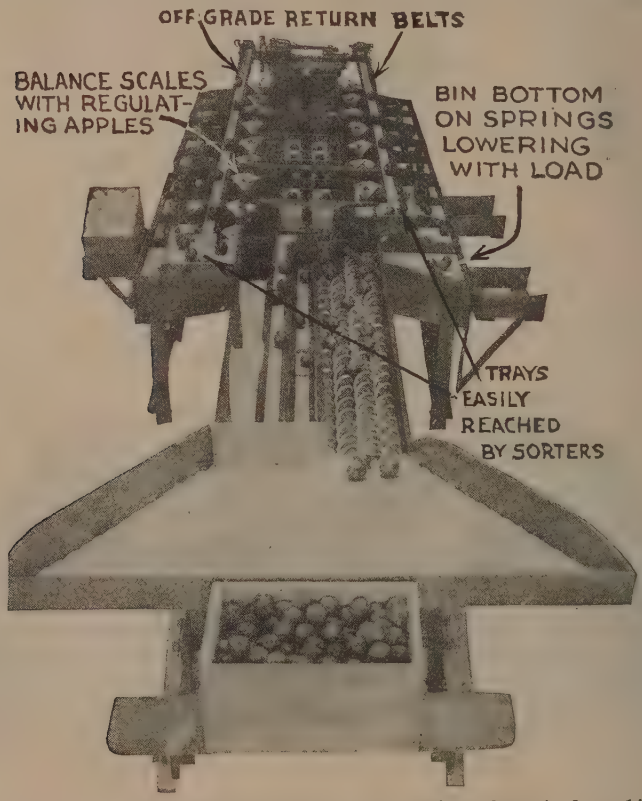

OFF GRADE RETURN BELTS
BALANCE SCALES WITH REGULATING APPLES
BIN BOTTOM ON SPRINGS LOWERING WITH LOAD
TRAYS EASILY REACHED BY SORTERS

FIG. 15.—Another view of the machine shown in figure 14.

ent in design. All models of this type of machine are 6 feet 8 inches in width but vary in length from 26 to 32 feet. The largest size is equipped with 24 bins. In this case each apple weights itself, on the principle of Newton's law of motion, which established the fact that the distance that a body is tossed by a given force is proportional to its weight. The apples are tossed or thrown from cups actuated by a cam motion, the bin into which they fall being determined by the initial velocity and the weight of the apples. The cups are attached

to levers which in turn are attached to the springs that supply the force.

The operation of these machines is simple. The apples are carried to the cups by means of a sorting belt and are tossed one at a time with precisely the same force into a line of soft cloth catchers. Each cup throws all sizes of apples, but in order to size more than one grade or to increase the output an additional number of cups must be used.

The number of bins is determined by the capacity desired as well as by the number of grades and the number of sizes in each grade. The four-cup machine has 24 bins, 12 on each side. Where three

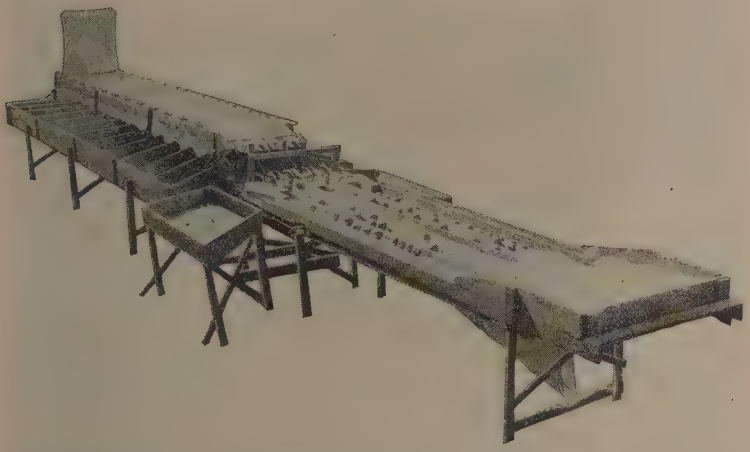


FIG. 16.—This machine sizes the apples by tossing them into the air. Note the padded feeding hopper, the sorting table, the throwing cups, and the cloth catchers which break the fall of the fruit into the bins.

grades are packed, the first grade goes into bins 1 to 10, the second grade into bins 7 to 17, and the third grade into bins 14 to 24. There is an overlapping of grade in a few of the bins, but where this is the case the apples of one grade are so much smaller than those of the other that there is no difficulty in separating them. Where either one or two grades are packed, there is no overlapping of sizes.

GRAVITY CONVEYORS.

Gravity conveyors are used extensively in most packing houses, and with the present high wage scales such equipment is essential to the economical handling of apples. (See fig. 17.) Such conveyors are made in standard 10 and 12 feet lengths, although sections of any desired length can be made to order. Formerly the conveyors used for this purpose were made of steel, but at the present time

apple packing houses are being equipped with a cheaper grade having either maple rollers or iron wheels. The packing season is relatively short and experience has shown that the most expensive steel rollers are not necessary under such conditions. The roller conveyors usually are made with steel frames and are equipped with ball bearings. The frame of wheel conveyors is constructed of wood or steel and the wheels are of iron with steel axles. (See fig. 21.) Boxes do not attain the momentum on the wheel conveyors that they do on the roller conveyors, and for that reason it is necessary to give them a steeper pitch.

Sections of conveyor are used in unloading loose fruit from the orchard wagon to the storage and in handling the fruit from the

FIG. 17.—Note gravity conveyor for carrying packed boxes to the lidding press. Underneath is a slide for carrying empty boxes to the packers.

loose-fruit storage to the sorting belt, from the packers' stands to the lidding presses (Note conveyor along side wall in fig. 18), and from there to the packed fruit storage. They are also used for carrying empty boxes to the packers as well as for carrying packed boxes about the house and for delivering them from the storage into the cars for shipment.

In moving packed boxes from the packers' tables to the lidding presses, wheel or roller conveyors with 3 inches between the centers of the rollers should be used, as even a slight jarring of the boxes will disturb the pack; but after the boxes have been lidded the cheaper rolls, which are 6 inches between centers, may be used satisfactorily. Some prefer the wheel conveyor for carrying the packed

boxes to the lidding press, as the wheels catch only the ends of the box and less bruising of the fruit may be expected than where a box which is resting on the bulge is carried on the flat roller. Some objection has been made to the wheel roller with close centered wheels

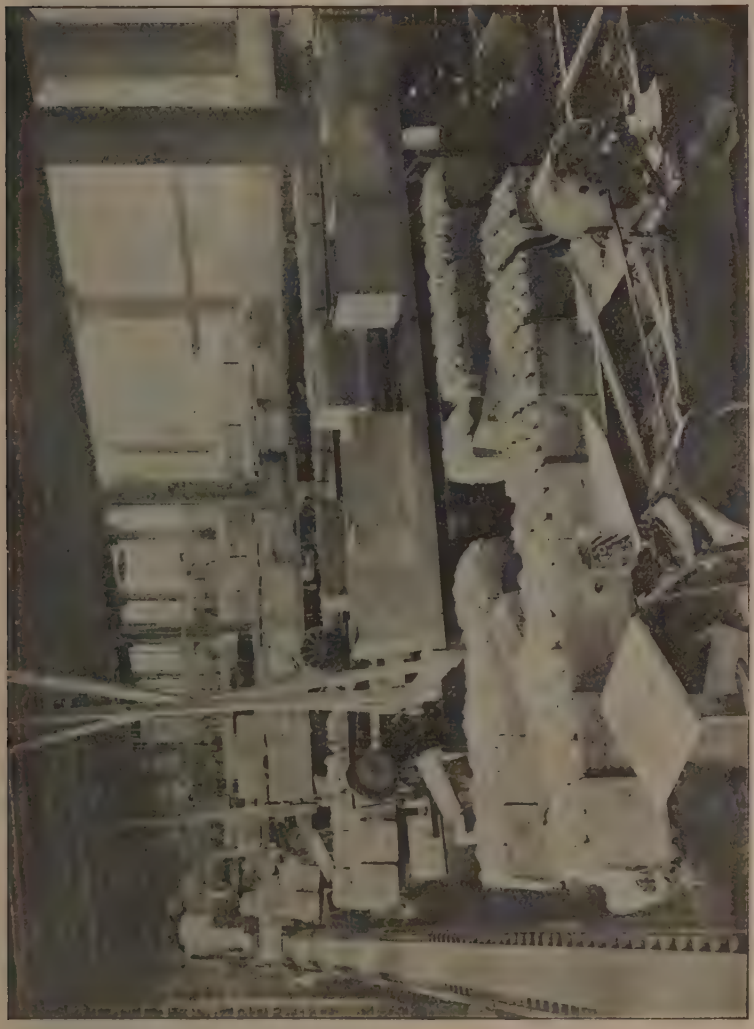


FIG. 18.—Interior of an apple-packing house. Note on the left the live belt running over a roller conveyor.

because the employees are apt to get their fingers pinched and cut when placing the boxes on the conveyor. Packed boxes placed on the sides are more likely to carry off the wheel conveyor if the wood is rough grained. In figure 18 another conveying arrangement is

shown. The live belt runs over a roller conveyor to carry packed boxes of fruit from the packers' tables to the lidding presses.

Wheel conveyors are not so convenient as roller conveyors because the boxes must be placed on both lines of wheels rather than set on one side and pushed into position, and the additional lifting is much harder, especially for women packers. As most packing houses employ women for packing, it has become a general practice to provide a man to lift the packed boxes from the packers' stand to the wheel conveyors.

Where the packing operations are not extensive, wooden slides may be used instead of gravity conveyors. These slides are inexpensive, and if well greased with paraffin they are very convenient in carrying the packed boxes for short distances from the packers to the lidding presses and from the lidder to the assembler or trucker.

In addition to facilitating the handling of the fruit, conveyors or slides serve as stands for receiving the packed boxes from the packers' table. Packed boxes should never be stacked one upon another on the conveyors before they are lidded, as this practice frequently results in injury of the fruit.

ELEVATORS AND CHUTES.

Although a few large packing houses still use the straight lift or freight elevator commonly found in industrial plants, most of these houses are equipped with elevators especially designed for carrying apple boxes. Probably the cheapest and most common type consists of an endless belt provided with cleats to prevent the boxes from slipping or tipping over when traveling up a relatively steep pitch. Chains equipped with lugs are sometimes used in place of the belts. The belts are made of 3-ply stitched canvas or of rubber fabric. These belts or chains travel over and are supported by an iron-covered or plain smooth board. A few houses are equipped with elevating belts that run on roller conveyors.

Inclined belts and chain elevators are used more extensively for lowering than for elevating the fruit, because boxes may be fed automatically from gravity conveyors when the boxes are being lowered, but it is necessary to place the boxes on the belt by hand when this arrangement is being used for elevating. An elevator of this type for lifting the boxes requires a separate feed belt at the base of the elevator before it will work automatically.

Some houses use a straight wooden or steel chute to lower the fruit. (See fig. 19.) Such a chute is not so satisfactory as a belt for lowering loose fruit in boxes because the contents are frequently spilled unless the employees use great care in the handling. Spiral chutes are also used extensively for lowering packed boxes; and although

some of the earlier installations are not altogether successful, the improved types are very satisfactory. In a three-story house a double spiral chute can be used to deliver the fruit from the packing room on the top floor to the first or second stories, and connecting the chute with gravity conveyors makes it possible for the boxes to be carried to any part of the storage or to be delivered directly into the cars for loading.

If the boxes are labeled in the packing room, they are generally wet with paste when delivered to the chute. This paste, if allowed to collect, gums the slides and interferes with the movement of the boxes.

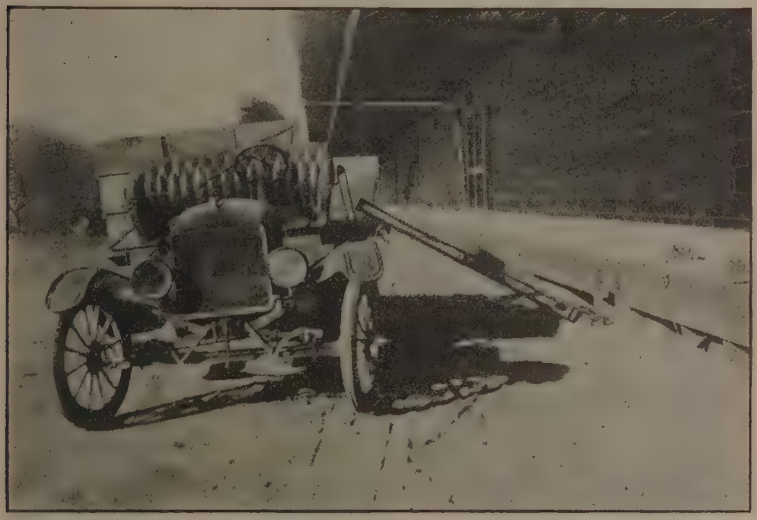


FIG. 19.—An iron chute for unloading apple boxes from the trucks to the basement. These chutes are hinged so that they may be pushed back against the building when not in use.

Some objections have been raised to the use of chutes because boxes are broken, but this is the result either of improper installation or of poor nailing. The first section of the gravity conveyor connecting with the delivery end of the chute may be equipped with guard rails to straighten out the boxes and to prevent them from running off the conveyor.

While it has been customary to lower the fruit automatically, the construction of an inclined elevator which is fed automatically from a gravity conveyor and which delivers the boxes at any desired height to a similar conveyor is comparatively recent. Such equipment is now available and is superior to the elevating belt if space must be economized. As the box is always carried in an upright

position, the conveyor may be operated at an angle of 30° from the perpendicular. Some of these conveyors are reversible and may be used for either elevating or lowering boxes. Figs. 20 and 21 show two types of mechanical elevators.

MISCELLANEOUS EQUIPMENT.

An interesting arrangement which enables one man to wait on the packers and also do the lidding has been observed in one ranch packing house. Two reversible packing stands equipped with casters are provided for each packer. As soon as one stand is filled it is replaced with an empty one and wheeled to the lidding press near by. This seems to be a very convenient arrangement for small operations. (See fig. 22.)

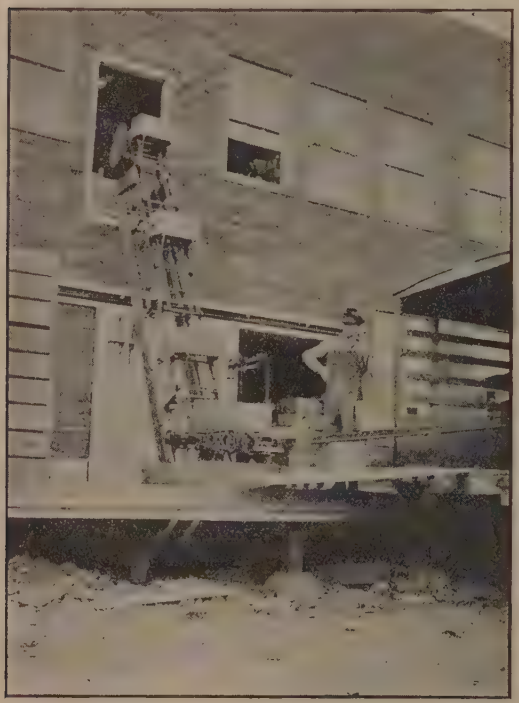


FIG. 20.—Elevator used for conveying loose fruit from the wagons to the packing room.

Several methods of cutting down the wastage of wrapping paper are employed. Some houses have found it most economical and convenient to provide a paper store located in the packing room. The one in charge has the duty of supplying a limited quantity of paper liners and wrappers to each packer. The liners are suspended from the packing stand by a hook or nail. If racks are used for the paper liners and wrappers, they should be placed underneath the packing bins so that the space above the machine will be clear of anything which would obstruct the light. In some of the larger houses one person is employed to supply the packers with wrapping paper, to feed the empty racks, and to put a lining paper in each box as it is placed in the box slide.

The packing is done by piecework, and each packer places an identifying ticket in each box as it is finished. The person collecting these tickets should be provided with a pigeon hole cabinet. This arrangement permits the sorting of the tickets as they are collected and relieves the office force of this work.

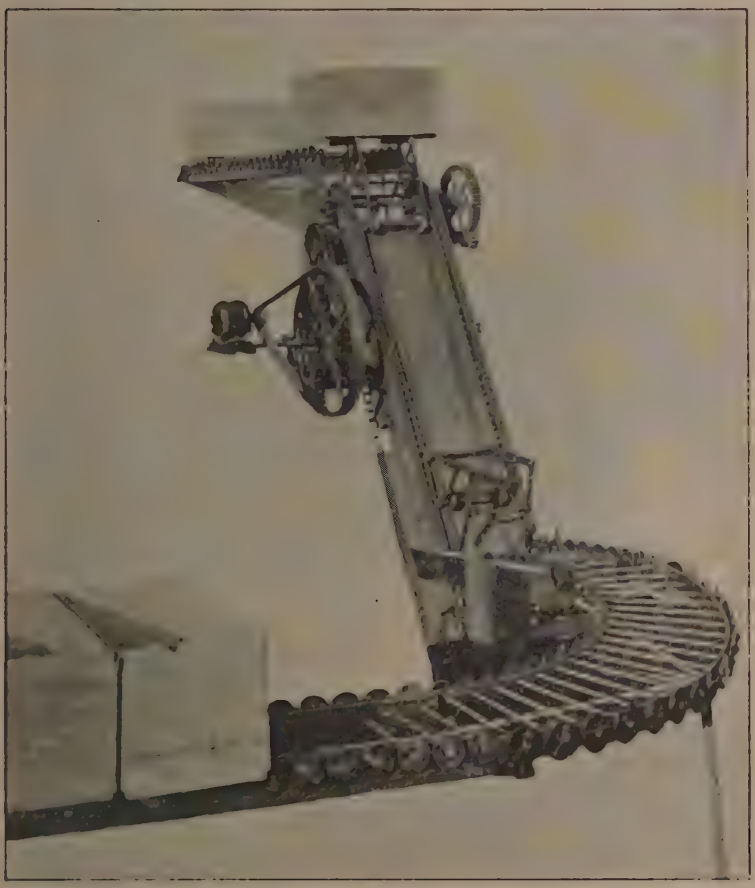


FIG. 21.—This elevator is fed automatically from the gravity conveyor. The boxes are discharged in the same manner.

If stamps are used by the packers, they may be suspended by cords running over a pulley. A weight keeps the stamps up out of the way when not in use. The stamp pads should be nailed either to the side of the table or to the packing bin. If placed over the bins the ink is apt to run into the bins and discolor the fruit.

Two-wheel hand trucks are used for moving stacks of packed boxes. The type which clamps under the box is generally preferable to that which clamps the ends. The latter may cut the labels, and when the clamps strike a knot they frequently slip and upset the load. If the cars are equipped with temporary floor racks, which have wide spaces between the floor boards, the bottom-clamp trucks are sometimes hard to release, but if the cars are equipped with standard floor racks this difficulty is avoided. Trucks equipped with steel wheels are easier to operate and do not need to be repaired so frequently as those which are equipped with rubber treads.

HANDLING THE LOOSE FRUIT.

Cooperative community packing houses employ two methods of handling the loose fruit. The one in most common use requires that each grower's fruit be kept separate until it is packed. As the fruit is unloaded at the receiving door a record is made by the receiving clerk, which shows the date, the grower's name, the variety of apples, the number of boxes, and the name of the driver, who is given a duplicate copy of the receiving slip. Every precaution should be taken to mark the lots so that each grower's fruit may be identified. Probably the best method of taking care of this point is to attach with a spring clip to the top box of each stack of loose fruit a card showing the name of the grower, the variety, and the number of boxes in each stack. These cards pass along with the stack until the fruit is run over the sizing machine, when they are turned into the office to be checked with the original receiving card. As the fruit passes to the "lidder" a record is made of the grower's name, the number of packed boxes, the grade, the variety, and the size of the fruit in each box. The fruit then goes into the house pool and loses its identity, or if the house packs for several growers under individual contracts each grower's fruit is stored separately.

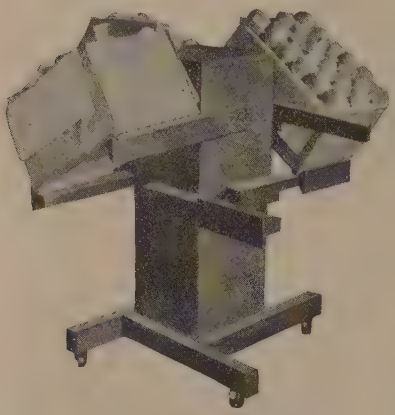
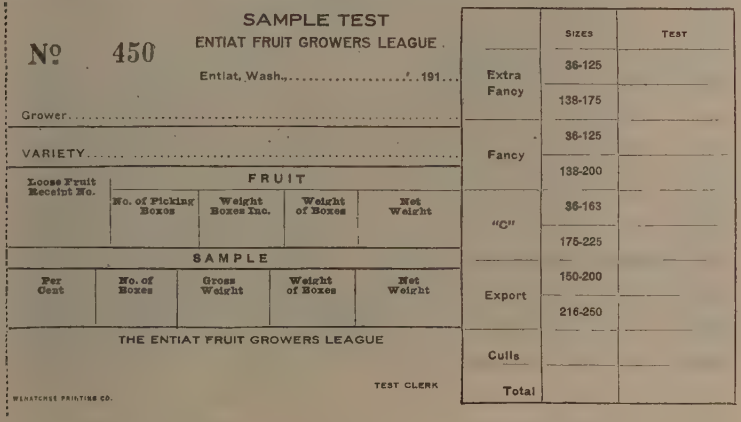


FIG. 22.—A four-box packing stand convenient for small operations where one man waits on the packers and does the lidding.

The pools are formed by putting fruit of the same variety and size together in one lot. Each grower receives credit for the amount of his fruit that goes into the pool, and returns are made on the basis of the average price received.

To eliminate the additional time and trouble required in retaining the identity of each grower's apples as they move through the

packing house, many cooperative organizations have adopted the sampling system. A receiving slip is made out in the usual way, but in addition the fruit should be weighed on a large platform scale and the gross, tare, and net weights recorded. A sample consisting of 5 per cent of the total weight of the load is delivered to the sampling room, which should be located near the packing room. The remainder of the load is delivered directly to the packing room or to the loose-fruit storage, where it is stacked with other fruit of the same variety without regard to ownership. In some houses these samples are designated by number instead of by the grower's name, so that those who do the grading have no knowledge of the ownership of the fruit. Perhaps it is unnecessary to say that the sampling room employees should be disinterested persons who could have no possible reason for showing partiality. They must be thoroughly competent



SAMPLE TEST

ENTIAT FRUIT GROWERS LEAGUE

No. 450

Entiat, Wash., ... 191...

Grower .....

VARIETY .....

Loose Fruit Receipt No.	FRUIT			
	No. of Picking Boxes	Weight Boxes Inc.	Weight of Boxes	Net Weight

SAMPLE

Per Cent	No. of Boxes	Gross Weight	Weight of Boxes	Net Weight

THE ENTIAT FRUIT GROWERS LEAGUE

TEST CLERK

WENATCHEE PRINTING CO.

	Sizes	Test
Extra Fancy	36-125	
	138-175	
Fancy	36-125	
	138-200	
"C"	36-163	
	175-225	
Export	150-200	
	216-250	
Culls		
Total		

FIG. 23.—A blank form used for recording the sample test data.

also, as the success of the system depends largely upon the accuracy with which this work is done. The workers should not be annoyed by visitors or by the confusion of the regular packing operations. The sampling-room equipment consists of a small platform scale and either hand tables and bins or a small specially built sizing machine.

The results of the test are recorded on a form similar to that seen in figure 23, and the grower is given credit for his whole load on that basis. The storage conditions in the sampling room usually are not good, and for that reason all the samples should be tested on the day of delivery in order that the tests may indicate fairly the quality and condition of the remainder of the lot, which, of course, is stored under more favorable conditions. Many cooperative community packing houses have used the sampling system for several years, and it has given thorough satisfaction. It is doubtful whether this system is more economical than where each grower's fruit is kept separate, but there is no question that the packing-house operations are expedited.

DISPOSITION OF CULLS.

Cull fruit should be delivered directly from the sorting tables to a point outside the packing room where it can be disposed of without interfering with the other packing-room operations. In some houses where grading belts and sizing machines are used, the culls are disposed of very conveniently and economically by providing a belt conveyor which delivers the defective apples from the pockets or chutes

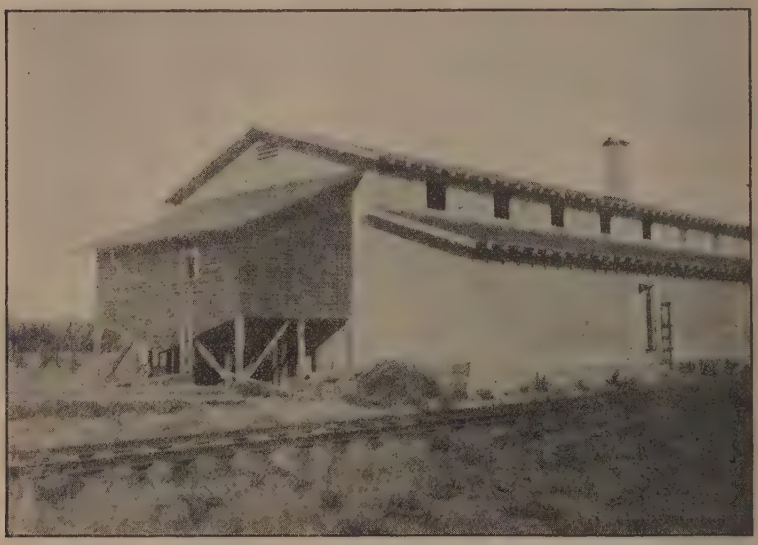


FIG. 24.—Slatted bin into which the culls are delivered from the sorting tables by a conveying belt. The fruit is emptied through a trap in the bottom of the bin.

into which they are dropped by the sorters to a large cull bin. (See fig. 24.) This belt should be equipped with cups or lugs to prevent unnecessary injury to the fruit. Where one or more sizing machines, grading belts, or long lines of hand tables are used, a conveying belt running beneath the floor sometimes is used for the disposal of culls. In several houses a cull bin that has a capacity of approximately one carload is built outside on the side of the house. The fruit is delivered into the bin from the sorting tables by conveyor belts and is removed through a trapdoor into the wagons or cars. In houses equipped with hand tables the culls are trucked from the sorters' tables to the cull bins or are stacked in the boxes outside the packing room.

ORCHARD BOXES.

Few growers use a special orchard box for packing and hauling apples, the fruit generally being delivered to the packing house in the standard apple boxes in which they are packed later. Cooperative associations and cash buyers usually purchase the shooks in

car lots and the boxes are made up for the growers in advance of the season. At the present time there appears to be a considerable wastage that might be materially reduced by a little more care in handling and by providing protection from the weather. There is good reason to think that the use of a strong lug box for handling loose fruit in the orchard and in the packing house would be more economical.

FIG. 25.—Hinged slide used for delivering empty boxes from the box storage to the growers' wagons.

About 70 per cent of the boxes used for hauling loose fruit are needed in the packing operations, or, in other words, it takes 10 boxes of loose fruit to pack out 7, so that about one-third of the boxes used for hauling may be old. As the fruit is emptied on the sorting table the dumper selects the clean, sound boxes suitable for packed fruit and places them in the empty-box rack or slide which carries them to the packers. The old and discolored boxes are returned to the orchard. When the house is using either grading belts or sizing machines a chute or conveying belt may be installed to deliver the empty boxes directly from the dumper to the place where they are assembled for delivery to the growers. Lofts, sheds, or covered porches are convenient places for assembling or storing empty boxes. In some instances a chute may be used conveniently for delivering them directly to the grower's wagon. (See fig. 25.) The slides used to supply the packers with empty boxes are sometimes fitted with rollers, and where this is the case the boxes should be run on the sides as the cleated bottoms catch on the rollers. The most convenient place for the slides is beneath the gravity conveyor which carries the packed boxes from the packers' bin to the lidding press. If the slide is constructed with a curved slope extending from the rear of

the dumping table to the gravity conveyor the empty boxes may be fed into the slide by the dumper. Slides or racks suspended over the gravity conveyor at a sufficient height to allow adequate room in placing the packed boxes on the conveyor will be rather high for convenience. They should not be suspended over the sizing machines or bins, because the dirt, sawdust, and refuse contained in the boxes would fall into the bins and injure the fruit. Suspended racks are also undesirable, as they obstruct the light from the side windows.

DUMPING.

The dumper who feeds the fruit to the sizing machine should regulate the amount so that the sorters will always be supplied with the maximum amount of fruit that they can grade properly. If the table is fed too fast the work will be relatively inefficient. Some feeders make a practice of keeping the hopper full of apples, the sorters next to the hopper pulling down the fruit with one hand as it is needed. In other cases the hoppers are equipped with an endless belt which delivers the apples to the sorting table. Less injury is likely to occur to the fruit in the hopper and better work is done where the dumper does not pour the apples any faster than the sorters can grade them. The feeding hopper should be built with a well-padded slatted bottom so that leaves and other refuse will be screened out and not carried to the sorting table. A rubber hose, split in half, may be used to good advantage for padding. The loose fruit boxes should be stacked around the dumper at a height that will eliminate unnecessary lifting.

STAMPING.

After the apples are packed, before the boxes are lidded the variety, grade, numerical count, and minimum net weight are stamped with blue ink on the end of the box directly above the label. Some shippers also include the packer's number and the grower's name. Several systems are used, but as a rule if the stamping is performed by either the packer or lidder the work is generally more or less inaccurate, because they do not feel that it is properly a part of their duties. Where this particular task is assigned to certain individuals they feel the proper sense of responsibility and the number of improperly or carelessly stamped boxes is reduced to a minimum.

The boxes are often labeled soon after stamping and before the ink has dried, so that the paste in brushing over the ink causes it to run and obliterate the marks more or less. If it is not possible to secure a more satisfactory grade of ink, it might be possible to use branding irons such as are used in many other industries for marking boxes. Most houses are equipped with electricity, and an electric grid might be used to heat the marking irons. Stamping machines are now made which hold all of the stamps being used, and it probably would be a simple matter to devise a similar arrangement for stamping with irons heated by electricity.

LIDDING.

After the boxes are packed and stamped, the covers are drawn into place by a lidding press and nailed. A properly packed box should have a bulge of 1½ inches in the center but tapering so that the apples in the ends are flush with the top. This bulge is necessary to keep the fruit in place after the normal amount of shrinkage has occurred. The tops and bottoms of apple boxes are made of light wood which bends readily, and after lidding the bulge of 1½ inches is distributed equally between the top and bottom. If the bulge is too high severe bruising will occur in the operation of pressing and, on the other hand, where the bulge is not high enough the fruit is injured in transit by the movement within the package. (See fig. 26.)

BOX PRESSES.

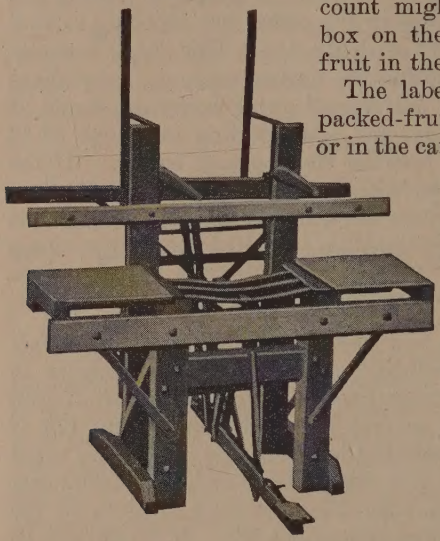
There are several types of box presses that are giving satisfaction. Strong, durable, and well-built presses such as are shown in figure 26 are most desirable. Such presses when constructed of iron or steel have been in use for several years without repairs, but if made of light material the repair bill in one season may easily equal the difference between the cost of a cheap press and a substantial one.

A good leverage is desirable with the downward pressure of the press-arms in line with the center line of the box. It should not be necessary to lift the boxes, but they should slide directly into the press from the conveyors. The foot ratchet should be made of hardened steel and should catch and release easily. Sufficient clearance should be allowed between the back of the press and the box to permit lifting the lining paper after the box is in place for lidding, and the press arms should also allow enough clearance for the nailer's hammer in nailing on the cleats. Provision should be made for enough space underneath the box to allow for the bulge. If the side arms are kept well greased with paraffin the boxes may be turned more easily as they are being fed. In connection with the lidding press, a support should be provided for the nail stripper, the cleats, and the lidder's hatchet.

LABELING.

In former years it was customary to label only the Extra Fancy and Fancy Grades of apples, but experience has shown that it is also advisable to label the C grade. As a matter of fact, this bids fair to become a standard practice, and without doubt it has assisted the sale of the lower-grade fruit. A good label is neat, simple, attractive, and should indicate the character of the product. The distinctive mark or figure used to indicate the grade or brand should stand out clearly enough to be seen at some distance. It is very desirable that the label be straight with the edges of the box and that it be kept free from scratches. A carelessly labeled box may con-

vey the impression that the product is an inferior one. Care should also be taken in applying the label to see that it does not cover the stamping; for the elimination of the statement of variety, grade, and count might result in the sale of the box on the basis of the least desirable fruit in the car.



The labeling is usually done in the packed-fruit storage, the assembly space, or in the car. In some instances the labels are put on before the boxes are made up, and occasionally the boxes are labeled as they come from the lidder's press. When this work is done in the car it usually results in torn labels and is more expensive, because the labeler is in the way of the car loaders and often is idle when the loading is delayed. He also interferes with the work of the checker, who records the variety and sizes as the boxes are loaded in the car. As each stack is labeled another stack is piled directly against the fresh labels, which are frequently defaced. They also may be scratched or pushed out of alignment when the load is braced.

When the boxes are labeled in a storage room they are not usually moved until the labels have dried thoroughly. A low wheel platform is used by the workmen to hold the labels and the paste

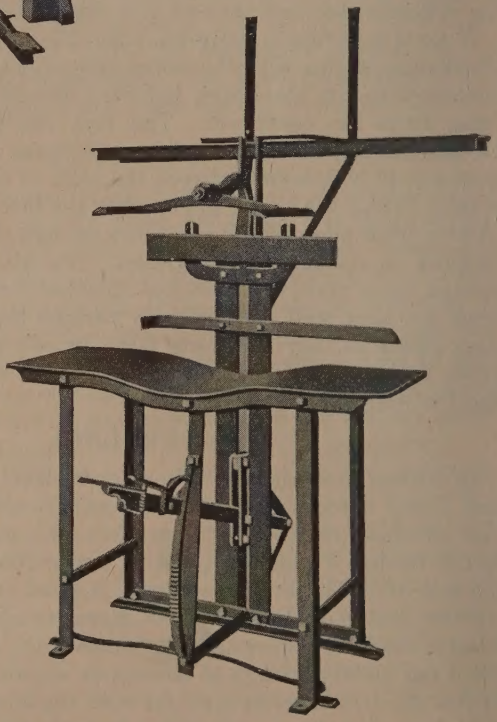


FIG. 26.—Two desirable types of lidding presses.

bucket. This method is not efficient nor convenient, because the boxes are segregated and trucked to different parts of the storage room, thus requiring the labeler to spend a considerable part of his time moving back and forth about the room. As the boxes are separated on the basis of variety and grade it is also often necessary to hold up the trucking operations so that unlabeled boxes will not be stored. More efficient work can be done at the point of classification, as the labeler's position is more stationary. The boxes are labeled after being stacked, and few labels will be defaced if the truckers use reasonable care.

If labeled boxes are furnished the packers, few labels will be torn when they are allowed to dry properly, but this system has not proved practical, because it is difficult in large operations to serve the packer with a properly labeled box. The packers generally use the boxes that they can reach most conveniently, and for that reason packed boxes often bear the wrong brand.

If truckers and the men who classify the fruit upon arrival in storage use sufficient care in handling the freshly labeled boxes, the most economical and convenient place for labeling is on the gravity conveyor in the packing room after the boxes have been stamped and lidded. Here the labeler's position is stationary, so that no time is lost in moving about. In one house that packed an average of 3,750 boxes a day during the past season one woman did most of the labeling, and the help was so supervised that very few boxes with torn labels were noted in the storage.

Only the best grade of paste should be used. Paste which has been frozen is worthless. It should also be borne in mind in applying the labels that if the paste touches the stamp marks the ink will run and make them indistinct.

LOCAL CONSIDERATIONS.

The successful coordination of the many different operations involved in packing northwestern boxed apples requires in each case a study of local conditions. It is possible to lay down certain principles which should be followed always; but where it is necessary to determine precisely what style of construction or type of equipment is best suited to the particular needs each packing house becomes a separate problem. Those who contemplate the construction of new houses or desire to improve their equipment and methods of operation may secure supplementary information upon application to the United States Department of Agriculture.

UNITED STATES DEPARTMENT OF AGRICULTURE